Superfund Program **EPA**
Proposed Plan **Region 5**
Allied Paper Landfill
Allied Paper/Portage Creek/Kalamazoo River Superfund Site – Operable Unit 1

EPA ANNOUNCES PROPOSED PLAN

This Proposed Plan identifies the Preferred Alternative for cleaning up the contaminated material at Allied Paper Landfill, Operable Unit 1 (Allied Landfill), of the Allied Paper/Portage Creek/Kalamazoo River Superfund Site and provides the rationale for this preference. This Proposed Plan also includes summaries of other cleanup alternatives evaluated for use at this Site. This document is issued by the U~~nited~~ S~~tates~~ Environmental Protection Agency (EPA), the lead agency for site activities. The Michigan Department of Environmental Quality (MDEQ) is the support agency. EPA, in consultation with MDEQ, will select a final remedy for the Site after it reviews and considers all information submitted during the 30-day public comment period. EPA, in consultation with MDEQ, may modify the Preferred Alternative or select another response action presented in this Proposed Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all of the alternatives presented in this Proposed Plan.

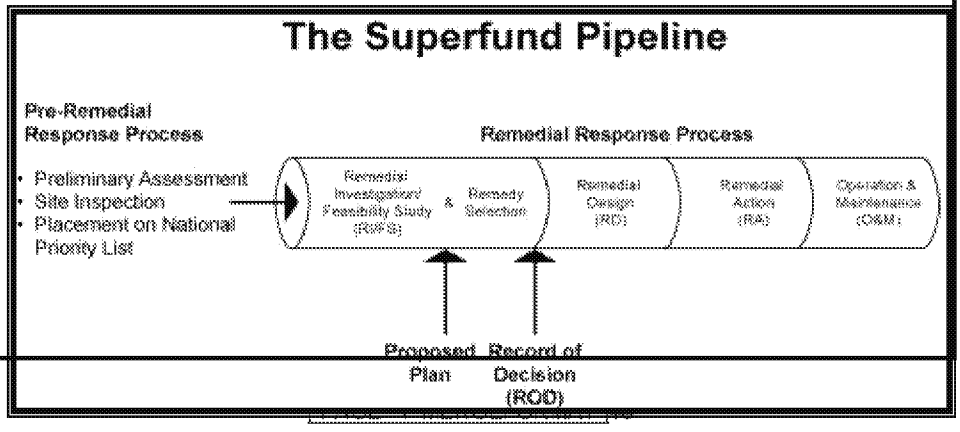
Dates to remember:

PUBLIC COMMENT PERIOD:
~~Month~~ **XX, 201~~2~~ – ~~January~~ ~~Month~~ 1, 2013**
U.S. EPA will accept written comments on the Proposed Plan during the public comment period.

PUBLIC MEETING:
~~November~~ ~~Month~~ **XX, 201~~2~~**
U.S. EPA will hold a public meeting to explain the Proposed Plan and all the alternatives presented in the Feasibility Study. Oral and written comments will also be accepted at the meeting. The meeting will be held at the TBD.

For more information, see the Administrative Record at the following locations:
Kalamazoo Public Library at
315 South Rose
Kalamazoo, MI.

EPA's Region 5 office
77 West Jackson Boulevard
Chicago, IL



The Pproposed Planremedy was developed in accordance with the requirements of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by Superfund Amendments and Reauthorization Act of 1986 (SARA) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Specifically, this decision document has been prepared in compliance with CERCLA Section 117 and NCP Section 300.435(c)(2) (11). This decision document explains the factual and legal basis for selecting the remedy for this Site.

EPA is issuing this Proposed Plan as part of its public participation responsibilities under Section 40 C.F.R. § 300.430(f)(2) of the "National Oil and Hazardous Substances Pollution Contingency Plan" (NCP). This Proposed Plan summarizes information that can be found in greater detail in the Remedial Investigation (RI) and Feasibility Study (FS) reports and other documents contained in the Administrative Record. The Administrative Record file for this site can be found at the Kalamazoo Public Library at 315 South Rose Kalamazoo, MI. and EPA's Region 5 office in Chicago. EPA and MDEQ encourage the public to review these documents to gain a more comprehensive understanding of the Site and Superfund activities that have been conducted at the Site to date.

SUMMARY of PROPOSED ALTERNATIVE

EPA is proposing Alternative 2B, which is summarized below:

- Excavate contaminated soil in impacted neighboring residential areas to the residential remedial action levels (RALs) in Table 2-3 and 2-4 and backfill with clean material;
- Excavate contaminated soil in impacted commercial/industrial areas (such as the Panelyte, Goodwill, Consumers Power and property immediately south of Alcott Street currently owned by Lyondell Trust) to commercial RALs in Table 2-3 and Table and backfill with clean material;
- Excavate the entire Monarch Landfill and pull back portions of the Bryant HRDLS/FRDLS, Former Landfill, and Western Disposal Area perimeter to create a setback that will act as a protective buffer along Portage Creek and to enhance long-term slope stability. Set back areas will achieve an RAL of 0.33 ppm PCBs where hydraulically connected to Portage Creek;
- Establish wetlands in the Panelyte Marsh, former Bryant Mill Pond and former Monarch landfill areas;
- Consolidate excavated contaminated material into the Bryant HRDLs/FRDLs, Type III Landfill and Western Disposal Area landfill areas. After consolidations, cover the landfill areas, with an engineered composite landfill cap. The cap will consists of six layers. The layers are (from bottom to top): a non-woven geotextile, a 12-inch-thick (minimum) sand gas venting layer or equivalent, a 30-millimeter polyvinyl chloride FML or equivalent (permeability less than 10^{-10} cm/secpermeability), a geosynthetic drainage composite layer, a 24-inch-thick (minimum) drainage and soil protection layer, and a 6-inch-thick (minimum) vegetated, topsoil layer. The consolidation and capping of material in the landfills on site relies on a risk-based method for the disposal of PCB remediation waste under 40 C.F.R. § 761.61(c);
- Fencing of the consolidated landfill areas;
- Restrictive covenants: a) to prohibit interference with caps, concrete, asphalt, containment systems and fences; b) to prohibit groundwater use; and to

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prohibit residential use in commercial/industrial areas; and d) to maintain wetlands areas.

•Groundwater monitoring of upper and lower aquifers to determine if COCs are migrating off-site.

SITE HISTORY

The Allied Paper, Inc./Portage Creek/ Kalamazoo River Superfund Site (the Site) is located in Allegan and Kalamazoo counties in southwest Michigan. The Site includes 80 miles of the Kalamazoo River, adjacent floodplains and wetlands, paper-residual disposal areas, and former paper mill properties, all pervasively contaminated with polychlorinated biphenyls (PCBs) as the result of the recycling of carbonless copy paper. The Site was listed on the National Priorities List in 1990; the State of Michigan posted fish advisories warning against any consumption of certain Kalamazoo River fish within the Site as early as 1977. The advisories remain in effect. Currently, the Site is divided into the following operable units (OUs):

- OU1: Allied ~~Paper~~ Landfill
- OU2: Willow Boulevard/A Site Landfill
- OU3: King Highway Landfill
- OU4: 12th Street Landfill
- OU5: Kalamazoo River and Portage Creek

This Pproposed Pplan addresses Allied Landfill which is located within the City of Kalamazoo, Michigan, and is defined as the areas between Cork Street and Alcott Street where contamination, from paper operations, is located. Portage Creek runs through the property bisecting the operable unit (OU). Allied Landfill includes areas that are zoned for residential, commercial, and manufacturing uses (Figure 1). Cork Street forms the southern boundary, and Alcott Street runs along the northern boundary. Residential development exists along a portion of the eastern side, and a railroad corridor forms a portion of the western boundary. Commercial and manufacturing properties are located north and south of Allied Landfill and along portions of the eastern and western sides of the property.

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The paper waste at Allied Landfill came from the Monarch and Bry~~s~~ant Mills. The Monarch Mill was located south of the OU and built by the Kalamazoo Paper Company in 1875. The Bryant Mills (A, B, C, D, and E) were built by the Bryant Paper Company in 1895 and produced a variety of high-quality paper products for the next 94 years. The Bryant Mills were formerly located within the OU and on properties adjacent to the north.

PCBs were introduced to Allied Landfill through the recycling of carbonless copy paper that contained PCBs as a carrier for the ink. Carbonless copy paper contained PCBs between 1957 and 1971, and PCBs remained in the recycle stream after that period as the carbonless copy paper supply was depleted. The key risk management goals established for Allied Landfill are associated primarily with exposure to PCBs in the various media.

The deposition of contaminated wastewater was the primary way in which Allied Landfill came to be contaminated. When mills recycled waste paper that included carbonless copy paper, PCBs were present in the wastewater produced from the recycling process. Typically, the wastewater contained large quantities of suspended particles—primarily cellulose and clay. The solid components of the recycling process adsorb or contain concentrations of PCBs. In the 1950s, mills began building clarifiers and dewatering or settling lagoons to remove most of the particles, and the clarified wastewater was discharged to rivers and creeks (in this case, Portage Creek). At Allied Landfill, the legacy of this practice is PCB-

containing materials in the Bryant Historic Residuals Dewatering Lagoons (HRDLs) and Former Residuals Dewatering Lagoons (FRDLs), the Monarch HRDL, and the Former Bryant Mill Pond. The PCB-containing materials, referred to in this report as residuals, have been the focus of the investigations conducted at Allied Landfill.

The Bryant Mill Pond was formed by the damming of Portage Creek at Alcott Street, impounding the creek within the northern part of the OU. The Alcott Street Dam was built in 1895 to provide hydroelectric power and to process water for the Bryant Paper Mills. The RI report for Allied Landfill discusses the Bryant Mill Pond in greater detail. In 1976, Allied Paper Company obtained a permit from the Michigan Department of Natural Resources to draw down the reservoir in an effort to reduce contamination impacts through discharge of sediment or groundwater to Portage Creek. Surface water in Portage Creek was lowered 13 feet during the drawdown and exposed sediments that had accumulated over the many years of mill operations.

Subareas

Allied Landfill consists of the following areas and subareas based on historical operations, as depicted in Figure 1:

- Former Operational Areas—Includes the Bryant HRDLs and FRDLs, Monarch HRDL (including the Former Raceway Channel), Former Type III Landfill, the Western Disposal Area, and adjacent Panelyte Marsh, the Conrail Railroad Property, and the State of Michigan's Cork Street Property.
- Former Bryant Mill Pond Area—Includes the area within the boundary of the Former Bryant Mill Pond, defined by a historical impoundment elevation of 790 feet above mean sea level (amsl). A portion of the Bryant Mill property south of Alcott Street is included within the area.
- Outlying Residential and High Occupancy Areas: Impacted residential areas include Clay Seam Area, East Bank Area and residential properties to the east of the former Allied Paper property.
- Outlying Commercial Areas~~Properties~~—Impacted commercial areas include the ~~Divided into the following subareas: Clay Seam Area,~~ Former Filter Plant, Panelyte property, ~~East Bank Area, four adjacent residential properties (Golden Age Retirement Community and three single-family residences), three commercial properties c~~(Goodwill, Consumers Power, and the Lyondell Trust property ~~(formerly MHLLC)~~ immediately south of Alcott Street.) ~~and property owned by Lyondell Trust (formerly MHLLC) but used by owners of the three single-family residences. The areas are referred to in this report collectively as the Outlying Areas (separate and not contiguous with the onsite Former Operational Areas~~).

Prior Response Actions

Allied Landfill was designated as a distinct OU within the Kalamazoo River Site, in part so cleanup activities could proceed on a separate schedule relative to the remedial activities developed for the Site as a whole. Between 1998 and 2004, a series of actions were completed to stop the ongoing contamination of Portage Creek and the Kalamazoo River by the Former Bryant Mill Pond. Cleanup of the Bryant Mill Pond minimized exposure potential by consolidating and capping that portion of the contaminated materials at Allied Landfill. These were the first cleanup actions on the entire site. The primary actions performed to date are summarized in the following subsections.

Time-critical Removal Action at the Former Bryant Mill Pond

EPA completed a time-critical removal action (TCRA) at the Former Bryant Mill Pond in 1998 and 1999. The work involved the excavation of

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146,000 cubic yards (yd3) of PCB-containing sediments, residuals, and soils and placement of the materials into the Bryant HRDLs and FRDLs. EPA performed the excavation in segments by using stream diversions to expose the sediment and excavate in dry conditions. After excavation, EPA collected confirmation samples, backfilled the area, and then removed stream diversions.

The TCRA was successful in removing a large ongoing source of PCB contamination to Portage Creek and the Kalamazoo River. Specifically, the TCRA involved excavating the PCB contaminated residuals from the Former Bryant Mill Pond up to 790 amsl. EPA's action level for the excavation was a PCB concentration of 10 milligrams per kilogram (mg/kg), and a goal of achieving post-excavation PCB concentrations less than or equal to 1 mg/kg. At locations where initial post-excavation PCB sampling results exceeded this goal, EPA removed an additional 6 inches of material and collected another post-excavation sample at the final extent. EPA then backfilled the excavated area with an amount of clean fill approximately equal to the volume of materials removed. The thickness of the backfill layer ranged from approximately 1 foot at the upstream end of the Former Bryant Mill Pond to approximately 10 feet near the Alcott Street Dam. EPA graded, seeded, and revegetated with native grasses and plants the surface of the materials it placed in the Bryant Mill Pond.

The post-excavation samples EPA collected from the final excavation were equal to or below the target PCB concentration of 1 mg/kg established for the TCRA in 435 of the 440 samples. The PCB concentration in the remaining five samples ranged from 1.8 mg/kg to 3.8 mg/kg. A total of 410 of the 440 final post-excavation samples were below the 0.33 mg/kg screening-level criterion protective of people eating fish recommended by MDEQ in the RI report.

PCBs were the driver for removal at the Bryant Mill Pond. Confirmation samples were not collected for other COCs that were identified in the RI. However, the RI identified that it is expected that COCs are co-located with the PCB residuals, and addressing PCB contamination is expected to address other COCs found at Allied Landfill. In addition, excavated areas were backfilled with 1 to 10 feet of clean fill and restored with native vegetation, thereby reducing the risk of direct dermal contact and erosion to Portage Creek in the excavated areas. The completeness of the TCRA was evaluated in development of the remedial alternatives and consideration of institutional controls. ~~However, other than the placement of institutional controls (ICs), EPA is not planning additional work for the Bryant Mill Pond where removal activities occurred below 790 feet amsl with the exception of the seeps.~~

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Interim Response Measures

MHLLC conducted a series of small-scale Interim Response Measure (IRM) activities to restrict access to Allied Landfill and to provide erosion control and stabilization in certain areas. This work began in the early to middle 1990s. Additionally, MHLLC removed remnant structures, such as the Filter Plant, from the historical mill operational areas during this time period. The former Bryant Clarifier remains in place.

MHLLC carried out IRM activities to stabilize the area the Bryant HRDLs and FRDLs after completion of the Bryant Mill Pond TCRA. The measures served to further mitigate the exposure to or transport of PCBs at Allied Landfill. The IRM completed at the Bryant HRDLs/FRDLs is summarized briefly as follows and described in detail in the RI report:

- Installation of sealed-joint sheet pile along the Bryant HRDLs and FRDLs adjacent to Portage Creek to stabilize the perimeter berms that

separate the materials in the Bryant HRDLs and FRDLs from the Portage Creek floodplain (Figure 1). The response action was completed in 2001.

- Removal of several hundred cubic yards of soil containing residuals from locations between the sheet pile wall and Portage Creek and consolidation into the Bryant HRDLs and FRDLs. The material was removed in 2000 and 2003 to minimize the potential for contaminated material releases to Portage Creek.

- Construction of an engineered composite cap for the Bryant HRDLs and FRDLs with its design based on Michigan Act 451 Part 115, solid waste regulations. The cap, which covers the Bryant HRDLs and FRDLs, was constructed between 2000 and 2004. MDEQ expressed concerns that the flexible-membrane liner (FML) was left exposed for substantial periods of time. MHLLC subsequently repaired the cap, rather than replaced as recommended to address MDEQ concerns. MDEQ remains concerned due to the number and quality of the repairs.

- Installation and operation of a groundwater extraction system inside the sheet pile wall and beneath the cap. The purpose of the system was to mitigate groundwater mounding behind the sheet pile, which might compromise the cap or inundate otherwise unsaturated residuals and increase the potential for migration of PCBs to the creek.

The cap was installed to act as a barrier to minimize the potential for direct contact; however, as the FML was left uncovered for an extended period and may not be fully mitigating the infiltration of precipitation that might form leachate.

MHLLC removed approximately 1,700 yd3 of residuals located in the floodplain on the eastern side of Portage Creek (referred to as the East Bank Area—Figure 1) and PCB-containing soils between the sheet pile and the creek as a 2002 IRM. The materials were consolidated into the Bryant FRDLs prior to construction of the landfill cap. The IRM methods and cleanup targets were similar to those used by EPA during the TCRA. Results of all post-excavation confirmation samples were below the target PCB removal criterion of 1 mg/kg, and the excavation was backfilled with a minimum of 1 foot of clean fill. The area was subsequently seeded and revegetated with native plants to restore the existing habitat.

MHLLC removed residuals exceeding 1 mg/kg in the IRM actions. They verified this with confirmation sampling. PCB concentrations above 1 mg/kg exist in areas of the floodplain where the IRM was not performed, specifically the seep areas. The areas will be considered for action in this FS.

SITE CHARACTERISTICS

Allied Landfill occupies 89 acres including Portage Creek between Cork and Alcott streets within the City of Kalamazoo. In 2008, the Michigan Department of Environmental Quality (MDEQ) summarized the remedial investigations in the 2008 Allied Paper, Inc. Operable Unit Remedial Investigation Report. Upon finalization of the RI report, the U.S. Environmental Protection Agency (EPA) assumed the responsibility of lead agency for the remainder of work to be done at Allied Landfill. Significant findings from the Remedial Investigation are discussed below:

GEOLOGY/HYDROGEOLOGY

Allied Landfill is situated on the floor of a north-south trending valley drained by Portage Creek. The creek flows northward, emptying into the Kalamazoo River about 2.25 miles north of the site. As shown below, the valley is flanked by hills formed of unconsolidated material that rise about 80 feet above creek level to the east and 100 feet above creek level to the west. The graphic/map

shown below and Figure 12 depicts the general topography of the Allied OU and its environs. Total relief across the site is about 70 feet, with elevations ranging from about 783 feet AMSL at the downstream end of Portage Creek (near the Alcott Street Dam) to about 853 feet AMSL at the highest point of the Monarch HRDL. The land surface of the Allied OU generally slopes toward Portage Creek.

Topography Graphic

Surface runoff at Allied Landfill is generally directed to Portage Creek. Runoff from the area capped during the IRM (i.e., the Bryant HRDL and FRDLs) is currently managed through a series of engineered drainage ditches and swales, routed to a settling basin (at the location of FRDL #2), and discharged to Portage Creek through an engineered outlet.

Geology

The geologic layers in the vicinity of the site generally consist of bedrock overlain by overburden. The bedrock underlying the region near the Allied OU consists of the Coldwater Shale formation. This formation is primarily fossiliferous shale (which contains limestone in some areas) and was deposited as mud in an offshore marine environment during early Mississippian time, about 350 million years ago. The surface of the formation, which near the site is estimated at an elevation of 650 to 700 feet above mean sea level (AMSL), slopes downward to the southwest. The formation is greater than 500 feet thick, with bedding dipping toward the northeast. Based on the elevation range provided above, the depth to bedrock beneath the site is estimated to be between 100 and 150 feet.

Seven geologic units were identified at the site based on site borings. The units include fill, residuals, peat, sand and gravel, silt, clay and till. Permeability is moderate to rapid, runoff is slow to rapid, and available water capacity is low to moderate.

Figure 1-2 and 3-4 identify the locations of representative geologic cross sections of the site. Figures 1-3 is a cross section running north-south from the City well field through the site, Figure 3-4 runs east west through the site. <cross-sections>

Hydrogeology

EPA has determined that impacted groundwater at Allied Landfill does not pose a risk outside of the waste. The City of Kalamazoo has raised concerns that contamination from Allied Landfill could migrate to the City well field. In 2009, MHLLC completed a Supplemental Groundwater Study to evaluate whether this pathway exists.

The study included an evaluation of existing data from Allied Landfill, the nearby Strebor facility, and the City wellhead protection model, and the collection of a new round of groundwater elevations at both properties. This additional round of groundwater elevations included a comprehensive network of wells from Allied Landfill and the Strebor, Panelyte, and Performance Paper properties sampled concurrently for the first time. The assessment of existing data supported previous determinations that a groundwater migration pathway from Allied Landfill to the City's Central Well Field is unlikely. This conclusion is based on the presence of a lateral aquitard beneath portions of Allied Landfill and an upward vertical hydraulic gradient between the regional aquifer (used by the City for potable purposes) and the shallow aquifer.

The groundwater elevation data supported the conceptual understanding of the following:

- Water is not dropping down to the elevation of the city wells as there is an upward gradient from the lower regional aquifer upward toward the surficial aquifer.
- Shallow groundwater flow in the area is to the east and not northwest toward the City's Central Well Field. Shallow groundwater from adjacent properties flows to the east and west onto Allied Landfill.
- Portage Creek is the point of discharge for shallow groundwater from Allied Landfill further directing groundwater away from the City Central Well Field.
- All available data suggest that a flow path from Allied Landfill toward the City's Central Well Field is unlikely.

Further empirical support for the conceptual understanding was provided by the analytical results for water samples collected by the City from its own production wells. There have been no detections of PCBs in the City's samples, even at trace levels.

The results of the supplemental groundwater investigation report provide a reasonable basis to determine that it does not appear there is a groundwater migration pathway from Allied Landfill to the City's Central Well Field. The complete report is included as Appendix A to the FS.

MDEQ generally concurred with the study's conclusions in an April 16, 2010 letter to EPA. In it, MDEQ stated the following:

- Portage Creek appears to be the primary influence on the configuration of the water table surface within Allied Landfill. In the main disposal area of Allied Landfill, shallow groundwater discharges radially to Portage Creek.
- Shallow groundwater is influenced, although not completely captured, by the creek.
- Due to the upward pressure exerted by the groundwater present in the regional aquifer, the downward flow of groundwater from the surficial aquifer monitored at Allied Landfill to the deeper regional aquifer is highly improbable.

Various data (collected over time) illustrate hydraulic disconnection between the surficial aquifer unit and the regional aquifer unit.

NATURE & EXTENT OF CONTAMINATION

Early investigative efforts recognized that if the full extent of PCBs were identified and appropriately remediated, then other associated substances at Allied Landfill would be appropriately addressed. The RI therefore focused on PCBs for identifying the extent of contamination. In addition to PCBs, several inorganics, volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs) were detected in soils, sediments, and groundwater. The RI report concluded the following:

- Target analyte list (TAL) inorganic constituents in soils and sediments that exceed criteria appear to be associated with the PCBs identified at Allied Landfill.
- Soils with inorganic impacts may be acting as a source resulting in low-level impacts to the groundwater.
- Target compound list (TCL) VOCs in soils, sediments and groundwater do not appear to be associated with contaminant impact identified at Allied Landfill. Detected TCL SVOCs in soils and sediments appear to have a similar distribution to the contaminant impact based on the data set available.
- The groundwater impact of detected SVOCs appears to be much less extensive than the SVOCs in soil at Allied Landfill. There were no SVOC exceedances of the screening criteria in the most recent sampling event.
- Concentrations of TCL pesticides did not exceed screening criteria.

- TCL pesticides were not present in the groundwater at the time of sampling, which is consistent with the soil and sediment data. One pesticide was detected in a leachate sample below screening criteria, but no exceedances were identified.
- Soils with visual indicators of residual impact can be expected to have PCB concentrations.
- During the most recent sampling, PCBs were detected in several of the groundwater seep monitoring wells located along Portage Creek near the Former Operational Areas, with PCB detections above the groundwater surface water interface (GSI) screening criteria in two locations.

Contaminants of Concern

PCBs are the primary contaminant of concern and therefore are being used as the primary indicator to define the extent of contamination at Allied Landfill. PCBs are associated with the residuals having entered the waste stream during the recycling of carbonless paper and appear to be the most widespread contaminant at Allied Landfill. As previously stated, most other COCs (inorganics and SVOCs) appear to be collocated with PCBs in the various media.

PCBs at Allied Landfill are widespread. They are present in the residuals and soils and sediments as a result of the residuals eroding and mixing into the soils and/or sediments near or at the ground surface, in certain subareas of Allied Landfill, including the Monarch HRDL and Western disposal area. Other impacted areas, ~~referred to as Offsite Areas,~~ include the Alcott Street Parking Area, portions of the Goodwill property, and the private residential properties. Figure 1-4 provides the aerial extent of PCB-containing surface soils and residuals. Figure 1-5 provides the aerial extent of PCB-containing subsurface soils and residuals.

PCBs are present on parcels owned by Consumers Power, the Golden Age Retirement Community, and certain single-family residential parcels, though the exact extent has not been confirmed. Soil borings from these adjacent properties had visual and/or analytical confirmation of PCBs ~~which is why EPA conservatively assumes that PCBs are present. EPA expects that~~ Additional surface and subsurface soil investigations will be carried out during the remedial design to either confirm the absence of PCBs or delineate the extent of PCB-containing soils/residuals before finalizing the cleanup boundaries for ~~the Site~~Allied Landfill.

PCBs are present in concentrations exceeding RALs ~~cleanup screening criteria~~ in the following areas: the soils and sediments in the Former Operations Area, Former Bryant Mill Pond, ~~certain~~ Residential Areas east of the former Allied Paper property, and certain neighboring ~~/~~Commercial Areas; in groundwater in the Western Disposal Area and Bryant HRDLs/FRDLs; and in seeps in the Former Type III Landfill Area adjacent to the Bryant HRDLs/FRDLs. PCBs were detected ~~exceeding criteria~~ in groundwater at isolated locations (3 of 56 monitoring well locations) and seeps (2 of 20 seep locations), all of which were all collocated within or adjacent to borings residuals were observed. As PCBs are not detected in groundwater outside of the waste, EPA does not believe there ~~is to be~~ a plume of PCBs emanating from Allied Landfill.

The highest exposure that is reasonably expected to occur at a site but that is still within the range of possible exposures is referred to as the reasonable maximum exposure (RME). ~~Though~~ PCBs are found in concentrations up to ~~as high as~~ 2,500 ppm, however ~~these detections are few and isolated~~. ~~T~~the RME for the site soils and sediments is 60 mg/kg. Based upon this exposure scenario and

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low mobility of PCBs at Allied Landfill, EPA considers PCBs to be a low-level threat waste.

Fate and Transport

The following PCB fate and transport mechanisms were evaluated at Allied Landfill:

- PCB transport from surface water runoff and soil erosion
- PCB transport in groundwater
- PCB transport in Portage Creek
- PCB transport in air

PCBs in Residuals

In general, PCBs are generally immobile. They are chemically and thermally stable, fairly inert, have low solubility in water, and have a high affinity for solids making them strongly adhere to residuals. Typically, the lower the water solubility of a chemical, the more likely it is to be adsorbed onto solids. Adsorption properties are generally characterized by an organic carbon partitioning coefficient denoted by Koc. The Koc values for PCBs are relatively high, which means that PCBs readily adsorb to organic material in media such as sediments and soils. The octanol water partitioning coefficient, Kow, is a measure of PCB's solubility in water. The coefficient is the ratio of the concentration of PCBs in octanol over the concentration of PCBs in water. PCBs tend to have high Kow indicating they are not very soluble in water. Taken together, the combination of low-water solubility and high Kow values indicates that PCBs have a strong affinity for soils and suspended solids, especially those high in total organic carbon.

In addition~~Additional~~ to organic content, other soil or sediment characteristics affect the mobility of PCBs. These include soil density, particle size distribution, moisture content, and permeability. Also, meteorological and physical conditions such as amount of precipitation and the presence of organic colloids (micron-sized particles) can also affect the mobility of PCBs in the environment. PCBs that are dissolved or sorbed to mobile particulates (for example, colloids) may also migrate with groundwater in sediments and soils.

PCBs at Allied Landfill do not readily migrate out of the paper residuals. The residuals present at Allied Landfill are composed primarily of fibrous wood material and clay. PCBs have a high affinity for the residuals due to the high organic content. When compacted, the residuals have a low hydraulic conductivity. The hydraulic conductivity of 10 residuals samples collected from Allied Landfill was approximately 1.3×10^{-7} centimeters per second. As water does not easily flow through the residuals, the opportunities for PCBs to migrate via groundwater are low.

Based on the combined effects of high affinity for PCBs to adhere to the residual and the low hydraulic conductivity, it is understood that PCBs do not migrate significantly from the residual material. This finding is supported by the lesser extent of PCB detections in groundwater samples than in soil or sediment.

Groundwater

PCBs do not appear to be migrating in groundwater beyond the waste management areas at the former Allied Paper property. ~~Landfill are not impacting groundwater outside of the waste material.~~ PCBs were detected in only 3 of 56 monitoring well locations and 2 of 20 seep locations. The exceedances of groundwater criteria occurred in wells screened within or immediately adjacent to the residuals. This finding supports the assumption that PCB transport in groundwater is limited.

Surface Water Runoff and Soil Erosion

There are portions of Allied Landfill (primarily in the Former Operational Areas) where

PCBs and other COCs are present in surface soils and residuals. The materials may be transported to the floodplain or sediments in Portage Creek by erosion through the air or surface water runoff.

Direct Discharge

The most significant historical source of PCBs to Portage Creek from Allied Landfill was the discharge of PCB-containing residuals at the Former Bryant Mill Pond. The excavation of PCB-containing sediments, residuals, and soils and subsequent replacement with clean fill in the Former Bryant Mill Pond has isolated the materials from direct contact with surface water, and removed the largest source of PCBs to Portage Creek at Allied Landfill. Under current conditions, the remaining potential sources of PCBs to Portage Creek from Allied Landfill are primarily associated with the erosion of contaminated soils and sediments.

SCOPE AND ROLE OF THE RESPONSE ACTION

This response action for Allied Landfill will address paper residuals primarily contaminated with PCBs at the Allied Landfill Property. The other OUs have been or will be addressed with separate remedial actions under separate Records of Decision.

SUMMARY OF SITE RISKS

Exposure to PCBs is the primary risk driver at Allied Landfill. MDEQ completed a *Site-wide Final (Revised) Human Health Risk Assessment* and *Final (Revised) Baseline Ecological Risk Assessment* for the ~~entire~~ Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site. The Human Health Risk Assessment (HHRA) quantitatively identified potential carcinogenic and non-carcinogenic risks to human health through exposure to media impacted with PCBs, including:

- consumption of fish by recreational and subsistence anglers
- direct contact with PCB contaminated materials by residents, recreational users and construction/utility workers
- inhalation of dust and volatile emissions from PCB contaminated materials

The Baseline Ecological Risk Assessment (BERA) quantitatively identified potential risks to various ecological receptors for different exposure pathways. ~~The mink (aquatic) and robin (terrestrial) are used to represent ecological receptors.~~

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EPA has determined that risk to human and ecological receptors exists at the Site based on the results of the HHRA and BERA. Prior to the start of the FS, EPA summarized the potential risks posed by PCBs at Allied Landfill in the 2009 "Summarization of Preliminary Remedial Goals Kalamazoo River/Portage Creek OU1." The memo incorporated information from the HHRA, BERA and Michigan Part 201 screening criteria to establish Preliminary Remediation Goals (PRGs) for Allied Landfill. Where available, for contaminants other than PCBs, updated Act 451, Part 201, screening criteria and drinking water maximum contaminant levels were used in the FS. EPA developed and evaluated alternatives in the FS to mitigate the risks.

As previously discussed, EPA has concluded that identification and appropriate remediation of PCBs will mean that associated chemicals of concern would also be addressed. Therefore the risk assessments focused on PCBs as the risk driver. Other potential contaminants of concern have been identified at Allied Landfill and will need to be considered with PCBs for the remedial action. Contamination has also been identified off-site at residential and commercial properties.

Current land use at the Allied Landfill property is industrial, although some adjacent residential properties contain residuals. The future land use at the former Allied Allied Paper property ~~Landfill~~ is expected to be commercial and recreational and will continue to be neighbored by residential properties.

INSERT TABLE OF COCs with exposure routes

REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) are general descriptions of the goals to be accomplished through cleanup activities. RAOs are established by considering/evaluating the medium of concern (soil, in the case of OU1), COCs, allowable risk levels, potential exposure routes, and potential receptors.

EPA has identified the following RAOs for the Allied Landfill OU:

RAO1	Mitigate the potential for human and ecological exposure to materials at Allied Landfill containing COC concentrations that exceed applicable risk-based cleanup criteria.
RAO2	Mitigate the potential for COC-containing materials to migrate, by erosion or surface water runoff, into Portage Creek or onto adjacent properties.
RAO3	Prevent contaminated waste material at the Allied Landfill from impacting groundwater and surface water.

PRGs were developed based on the potential exposure pathways, risk assessments and ~~State~~ ARARs. The RAOs, remediation goals, and remediation strategies, alternatives address unacceptable risks at the site. In addition to the quantitative PRGs identified, a qualitative remedial goal is also recommended that requires either remedial actions where residuals are visually observed or sufficient sampling to verify the residuals do not contain PCB concentrations above the applicable goals.

The public has indicated a preference for reducing the footprint of the landfills ~~to be reduced~~. The preference will be considered as part of the evaluation against EPA's nine criteria.

Remedial action levels (RALS) for PCBs are included in Table 2-3. RALs for COCs other than PCBs will follow the Michigan Part 201 criteria Table 2-4 March 25, 2011.

SUMMARY OF REMEDIAL ALTERNATIVES

~~In its capacity as the lead agency, it is~~ In the EPA's judgment, ~~that~~ the Preferred Alternative (Alternative 2B) identified in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, is necessary to protect public health, welfare, and/or the environment from the contaminated material at Allied Landfill.

- Alternative 1—No Further Action
- Alternative 2A—Excavate contaminated material above the RALs in Tables 2-3, 2-4 and from impacted Outlying residential and commercial areas; excavate and pullback the perimeter of the Bryant HRDLS/FRDLS, Former Landfill and Western Disposal Area to create a clean set back that will act as a protective buffer along Portage Creek; Consolidate ~~ion~~ Excavated Material onto Bryant HRDLs/FRDLs and Cap~~ping of contaminated material onto~~ Bryant HRDLs FRDLs, Monarch HRDL, Type III Landfill and Western Disposal Area; Establish wetlands in the Panelyte Marsh and Former Bryant Mill Pond. Monitor groundwater in shallow and lower aquifers.
    - Monarch Capped In-Place
- Alternative 2B – Excavate contaminated soil above the RALs set forth in Tables 2-3, 2-4 and

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from impacted residential and commercial areas. Excavate and pull back material along the perimeter of the Bryant HRDLs/FRDLs, Former Landfill and Western Disposal Area to create a clean set back; Consolidation and Capping of contaminated material onto Bryant HRDLs FRDLs, Former Type III Landfill, and Western disposal areas; Establish wetlands in the Panelyte Marsh, Former Bryant Mill Pond and Former Monarch Landfill area; Monitor groundwater in shallow and lower aquifers

- Monarch Excavated and Consolidated into Bryant HRDLs/FRDLs, wetland created in former Monarch Landfill area

- Alternative 2C – Excavate contaminated soil from impacted residential and commercial areas to the RALs set forth in Table 2-3, 2-4 and . Excavate material along the perimeter of the Bryant HRDLs/FRDLs, Former Landfill and Western Disposal Area to create a clean set back; Consolidation and Capping of contaminated material onto Bryant HRDLs FRDLs , Former Type III Landfill, and Western disposal areas with Offsite Incineration of Excavated Materials with PCBs Greater than 500 mg/kg; Establish wetlands in the Panelyte Marsh, Former Bryant Mill Pond; Monitor groundwater in shallow and lower aquifers.

  - Monarch Excavated and Consolidated into Bryant HRDLs/FRDLs, wetland created in former Monarch Landfill area

    ⇨

- Potential Groundwater Options for Alternative 2

- Subalternative (i)—Groundwater collection and treatment, which includes a system of extraction wells or trenches installed downgradient to capture groundwater before discharge to Portage Creek.

- Subalternative (ii)—Slurry wall installed downgradient of groundwater flow along with extraction wells or trenches to prevent groundwater mounding behind the slurry wall.

-

  - Monitoring required where residuals or soils remain

  - Optional groundwater hydraulic control and treatment

  - Optional slurry cut-off wall with hydraulic control and treatment

- Alternative 3—Total Removal and Offsite Disposal

- Alternative 4—Encapsulation Containment System

Groundwater monitoring is included in all of the alternatives that leave waste in place or consolidated onsite. Monitoring will include up- and downgradient wells to determine if COCs are migrating offsite. The following two options were considered as additional components of Alternative 2:

- Subalternative (i)—Groundwater collection and treatment, which includes a system of extraction wells or trenches installed downgradient to capture groundwater before discharge to Portage Creek.

- Subalternative (ii)—Slurry wall installed downgradient of groundwater flow along with extraction wells or trenches to prevent groundwater mounding behind the slurry wall.

In accordance with EPA guidance, the potential remedial alternatives identified in the FS and listed above were screened against three broad criteria: effectiveness (both short-term and long-term), implementability (including technical and administrative feasibility), and relative cost (capital and operation and maintenance [O&M]).

Common Elements of Alternatives

Alternative 2, 3 and 4 include p[P]redesign investigations ~~are required~~ to further delineate the nature and extent of concentrations of COCs

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exceeding RALs in Table 2-3, 2-4 and Table [ ] the relevant ~~PRGs for all alternatives, except Alternative 1 (No Further Action).~~ Additional surface and subsurface sampling is planned for the Former Bryant Mill Pond area, Panelyte Marsh and, Panelyte Property as well as ~~in~~ potentially impacted neighboring areas such as ~~will likely be necessary at~~ the Alcott Street parking lot, ~~Panelyte Marsh and Panelyte Property, as well as in the outlying areas including~~ the lawn area on the Goodwill property, beneath the parking lots on the Goodwill property, the Consumers Power property, the Golden Age Retirement Community property, several single-family residential properties, and the adjacent Lyondell Trust (formerly MHLLC) property.

Alternatives 2, 3 and 4 require excavation to meet the soil RALs set forth in Table 2-3, 2-4 and [ ]. The results of the predesign work would be used to define the extent of the remedial response for the areas. ~~Details of the predesign work would be developed once a final remedy is selected.~~ Based on observations from the RI, EPA is assuming that by addressing PCBs in the Bryant Mill Pond Area, other COCs were~~ill be~~ addressed. Confirmation sampling will be performed during the implementation of the remedial action to verify this assumption in the Bryant Mill Pond Area as well as the Outlying residential and commercial areas after excavation.

~~AAll~~ Alternatives 2, 3 and 4 ~~alses than Alternative 1~~ include restrictive covenants to implement the following restrictions: a) prohibit interference with engineered caps, containment systems and fences; b) prohibit residential use in commercial/industrial areas; c) prohibit groundwater use throughout the Site; and d) maintain wetlands areas ~~some form of institutional controls. Alternatives that leave PCBs in place above 1 ppm PCBs will require a restrictive covenant in commercial areas and prohibiting sitewide use of groundwaterAlternatives 2 and 4 require Properties with caps covering PCBs in place will requirecontainment systems and fences, ap~~

~~(for example, deed restrictions and access restrictions).~~ Alternatives 2, 3 and 4~~ll alternatives~~ also incorporate a groundwater monitoring program that would include periodic sampling of sentinel wells and [description of other wells]~~according to a plan developed by EPA~~. According to RAO 3, the purpose of the program is to monitor the performance of the remedy including compliance with ARARs. ~~The~~ The groundwater monitoring plan will include sampling and analysis of all TALs and TCLs ~~during the initial sampling events. The~~ groundwater monitoring plan would also evaluate upgradient groundwater concentrations for determination of local background conditions. ~~Groundwater collection systems have been evaluated as additional components for on-site disposal alternative 2.~~

Partial or complete removal of the existing sheet pile wall would be evaluated as a component of the other alternatives. The 2,600 linear feet of sealed-joint sheet pile installed in 2001 along the western bank of Portage Creek was installed to stabilize the perimeter berms of the Bryant HRDLs and FRDLs. It would be maintained under Alternative 1 (No Further Action). If the wall is required for stabilization, the wall will be cut off at ground surface and individual panels may be removed to allow groundwater flow to the creek, eliminating the need for the existing collection system.

~~No additional remedial activities are proposed for the the Former Bryant Mill Pond Area, the East Bank, and the Clay Seam Area other than implementation of Institutional Controls.~~

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Alternative 1—No Further Action

The No Further Action alternative is required in the evaluation of remedial options ~~of~~ under the National Oil and Hazardous Substances Pollution Contingency Plan and serves as a baseline against which the other potential remedial alternatives can be compared.

No further active remediation would be performed in any portion of Allied Landfill under this alternative. ~~Natural attenuation processes would continue, but would not be monitored to gauge progress toward the RAOs.~~ The potential for human and ecological receptors to be exposed to COCs would not be addressed, and there would remain a potential for COCs to erode into Portage Creek over time since there would be no maintenance of the existing fence, cap, soil cover, or the other engineered control systems. Operation of the groundwater collection/treatment system would be discontinued.

Alternative 2—Consolidation and Capping

The primary elements of Alternative 2 are:

- Excavate contaminated soil in impacted neighboring residential and other high occupancy areas to residential RALs in Table 2-3 and 2-4 and backfill with clean material;
- Excavate contaminated soil in impacted commercial/industrial areas, including the Goodwill, Consumers Power, Panelyte and commercial property immediately south of Alcott Street to the commercial/ industrial RALs in Table 2-3 and of 10 ppm PCBs, unless a sufficient cap or other containment exists to prohibit exposure. These commercial areas will require restrictive covenants to prohibit residential use and prohibit interference with containment systems if applicable.
- Excavate Monarch Landfill and and excavate and pull back portions of the Bryant HRDLs/FRDLs, Former Landfill, and Western Disposal Areas perimeter to create a setback that will act as: landfill areas and Portage Creek to create clean set back, as a:
  - protective buffer along the creek,
  - to enhance long-term slope stability,
  - provide room for the monitoring well network,

Set back areas with achieve a RAL of 0.33 ppm PCBs where hydraulically connected to Portage Creek;

- Establish wetlands in the Panelyte Marsh and former Bryant Pond area;
- Consolidate excavated contaminated material ~~is in-place consolidation and containment with erosion control measures. This includes consolidation of the Outlying Areas~~ into the Bryant HRDLs/FRDLs, Type III Landfill and Western Disposal Area.

~~Alternative 2 options differ in that 2B and 2C include the consolidation of Monarch into the Bryant HRDLs, FRDLs, Type II Landfill and Western Disposal Area. Alternative 2A leaves the Monarch HRDL in place.~~

- ~~Alternative 2 includes~~ Ceovering the landfills after consolidation with an engineered composite landfill cap. ~~A clean set back will be left between the landfill and Portage Creek to allow room for monitoring wells and a groundwater collection treatment system, if necessary.~~ The cap will consists of six layers. The layers are (from bottom to top): a non-woven geotextile, a 12-inch-thick (minimum) sand gas venting layer, a 30-millimeter polyvinyl chloride FML or equivalent (permeability less than 10^{-10} cm/sec), a geosynthetic drainage composite layer, a 24-inch-thick (minimum)

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drainage and soil protection layer, and a 6-inch-thick (minimum) vegetated, topsoil layer. ~~At Allied Landfill, given the nature of the residuals and the contamination, EPA expects this proposed cap design to offer the same degree of protectiveness as would a Michigan Part 111 cap.~~

In the nearby commercial areas ~~Outlying Areas~~ where there are concrete flooring ~~structures~~ that serve to mitigate direct contact and hinder the ability to remove impacted materials, restrictive covenants ~~institutional controls will~~ could be employed ~~to that will require either~~ prohibit interference with the existing structures to remain in place as barriers ~~unless or remediation of~~ contaminated material is remediated pursuant to a state or EPA approved plan.

Post- excavation confirmatory sampling and analysis will ~~ould~~ be performed. Once cleanup goals have been achieved, the excavated areas would be backfilled with clean material, graded to mitigate ponding, and revegetated. The Panelyte Marsh and ~~Former Monarch Raceway Channel and other wetlands~~ would be backfilled to existing grades and restored to promote the re-establishment of native vegetation and wetlands.

Alternative 2 options, described in the following subsections, would include long-term inspections and maintenance of the existing and newly installed engineered landfill caps, and the remaining portions of the exiting sheet pile. A long-term monitoring program will be implemented to evaluate~~d~~ the performance of the remedy and verify that the remedy and the groundwater quality conforms to ARARs, applicable risk-based standards and ~~to provide for~~ the appropriate management of landfill gas.

The primary mechanism for this will be a groundwater monitoring network consisting of existing and new monitoring wells ~~will be~~ located outside areas where waste remains in place (i.e. Bryant HRDLs/FRDLs and or/Monarch HRDL Areas). In addition, sentinel well will be installed to monitor the lower aquifer…. Groundwater samples will be taken and analyzed in accordance with 40 C.F.R. § 761.75(6) and Michigan Part 201. Need reference to Table here.

For Alternatives 2A, 2B, and 2C described in the following subsections, EPA evaluated inclusion of subalternatives for hydraulic control of groundwater. For subalternative (i), EPA considered the installation of a groundwater collection and treatment system. The groundwater collection and treatment system consists of groundwater extraction wells and a series of sumps and lateral drain lines. Subalternative (ii) consists of a grout slurry wall installed down-gradient of the Bryant HRDLs/FRDLs and Monarch HRDL to contain impacted groundwater located within Allied Landfill. The slurry wall would extend approximately 40 feet below ground surface based on current sheet pile wall design. The slurry wall would not necessarily key into clay or bedrock—portions of the slurry wall at this depth would still terminate in the upper sand zones. Subalternative (ii) includes the same groundwater collection and treatment system as Subalternative (i).

~~Both~~ A common element of Alternative 2 options is ~~alternatives would include~~ institutional controls , including restrictive covenants to prohibit interference with containment systems, to prohibit groundwater use, to prohibit residential use in commercial/industrial areas and to maintain wetlands. ~~(for example, deed restrictions to prevent exposure of PCBs at depth, and informational devices) and access restrictions (perimeter fence with posted warning signs). The institutional controls would be implemented at Outlying Areas and the onsite disposal areas to prevent actions that~~

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might result in direct contact with COC-containing materials that remain.

Alternative 2A—Consolidation of Outlying Areas on HRDL/FRDL and Monarch HRDLs

Under Alternative 2A, contaminated soils from impacted Outlying residential and commercial Outlying Areas located within the operational unit s and perimeter areas around the landfills would be excavated to the RALs in Table 2-3, 2-4 and and consolidated on the Bryant HRDLs/FRDLs and Monarch HRDL. After consolidation, each landfill would be covered with an engineered cap.

Portions of the Bryant HRDLs/FRDLs, Monarch HRDL, Former Type III Landfill, and Western Disposal Area perimeter will be excavated/pulled back and consolidated within the onsite disposal areas to create an adequate setback, as a:

- protective buffer along the creek,
- to enhance long-term slope stability,
- provide room for the monitoring well network,
- and space for a contingent groundwater collection system if necessary.

This alternative includes the pull-back of waste from the creek and removal of at least portions of the sheet pile wall so that it no longer impedes groundwater flow to Portage Creek. Wetlands would be established in the Panelyte Marsh and former Bryant Mill Pond.

Alternative 2B—Consolidation of Outlying Areas and the Monarch HRDL on HRDL/FRDL

Under Alternative 2B, the contaminated soils from impacted Outlying residential and commercial areas, perimeter areas around the landfills a Outlying Areas and the Monarch HRDL would be excavated to the RALs in Table 2-3, 2-4 and and would be consolidated on the Bryant HRDLs/FRDLs Landfill. The perimeter area excavation and subsequent capping of the entire Bryant HRDLs/FRDLs would be conducted as described in Alternative 2A.

Portions of the perimeter around the Former Type III Landfill and Western Disposal Area would be pulled back and consolidated on the Bryant HRDLs/FRDLs Landfill and capped. Alternative 2B is depicted in Figure 2B.

Wetlands would be re-established in the Panelyte Marsh, former Bryant Mill Pond and Monarch Landfill area.

Alternative 2C—Consolidation of Outlying Areas and the Monarch HRDL on HRDL/FRDL with Offsite Incineration of Excavated Materials with PCBs Greater than 500 mg/kg

Under Alternative 2C, the-, contaminated soils from impacted residential and commercial areas, perimeter areas around the landfills Outlying Areas and the Monarch HRDL would be consolidated on the Bryant HRDLs/FRDLs Landfill. The perimeter area excavation would be conducted as described in Alternative 2A. Portions of the perimeter around the Former Type III Landfill and Western Disposal Area would be pulled back and consolidated on the Bryant HRDLs/FRDLs Landfill. Excavated materials with PCB concentrations above 500 mg/kg would be transported for offsite incineration.

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Remaining materials with PCB concentrations of 500 mg/kg or less would be consolidated on the Bryant HRDLs/FRDLs and subsequently capped.

The design investigation will be used to identify hot spots within the area to be consolidated with PCB concentrations greater than 500 mg/kg. For the purpose of the Feasibility Study, it is assumed that approximately 5 percent of the soils excavated from the pullback near the Western Disposal Area and Former Type III Landfill would require offsite incineration. Approximately 2 percent of soils excavated from Outlying Areas, Monarch HRDL and the setback between Portage Creek and Bryant HRDLS/FRDLs would require offsite incineration. These assumptions are based on the cumulative distribution functions performed in a statistical evaluation by the EPA Field EnvironmentaL Decision Support (FIELDS) Team using the existing data sets. Wetlands would be re-established in the Panelyte Marsh, former Bryant Mill Pond and Monarch Landfill area.

Alternative 3—Total Removal and Offsite Disposal

The primary element of Alternative 3 is the excavation and offsite disposal of all areas. and the alternative includes the following:

- All offsite outlying areas other than the portion of the Goodwill property that may be covered by buildings
- Former Operational Areas—The Monarch HRDL, the Former Type III Landfill, the Western Disposal Area and the Bryant HRDLs/FRDLs
- Other onsite areas with PCB-containing materials that lie close to Portage Creek, including the Panelyte Marsh, the Panelyte Property, and the Conrail Property

Materials will be excavated and transported directly to offsite commercial landfills. Materials with PCB concentrations of 50 mg/kg or greater would be transported to and disposed of in approved offsite landfills permitted to receive TSCA-regulated wastes. Materials with PCB concentrations less than 50 mg/kg would be transported to and disposed of at other permitted and approved landfills as appropriate. Excluded from removal are the PCB-containing materials that may be located under existing buildings on the Goodwill property.

Post-removal confirmatory sampling and analysis would be performed at the excavation areas. Once cleanup goals have been achieved, the excavated areas would be backfilled with clean material, graded to mitigate ponding, and revegetated or otherwise restored to wetlands~~match the surrounding areas~~. The Panelyte Marsh, the Former Monarch Raceway Channel, and other wetland areas would be backfilled to existing grades and restored to promote the re-establishment of native vegetation and wetlands. The excavated and backfilled area would extend across approximately 65 acres.

In addition, part of this alternative would include the removal of 2,600 linear feet of sealed-joint sheet pile along the western bank of Portage Creek to the extent feasible. The groundwater treatment system would be decommissioned and removed, and the network of groundwater extraction trenches, sumps, and wells currently in place behind the sheet pile wall would be removed and disposed.

This alternative is developed with the intent of removal of all material containing COCs above Allied Landfill PRGs. However, if it is not feasible to remove some of the material, groundwater monitoring would be performed in areas where exceedances remain. Monitoring would be

performed as described in Alternative 2 options and 4. Institutional controls (for example, deed restrictions and enforcement tools) would be implemented for the areas where COCs may be left in place (for example beneath the existing buildings on the Goodwill property), to prevent actions that might result in direct contact with these materials.

Alternative 4—Encapsulation Containment System

The primary element of Alternative 4 is the full encapsulation of impacted materials onsite, including the following:

- Excavate approximately 1,500,000 yd^3 of soil and/or sediment containing PCBs above the relevant RALs ~~PRGs~~ and then place them in a series of full-encapsulating cells
- Construct a landfill bottom liner in previously excavated former landfill areas
- Place excavated materials on the newly constructed landfill liner
- Excavate and consolidate other onsite areas with PCB-containing materials in the new landfill areas
- Construct a landfill cap over the new landfill areas (same construction as Alternative 2 in Section 4.3)
- Some materials could be volumetrically displaced and would be disposed of in offsite commercial landfills

The same areas identified in Alternative 2 are targeted for excavation in Alternative 4. Excluded from removal are the PCB-containing materials that may be located under existing buildings on the Goodwill property.

In the outlying areas, once cleanup goals have been achieved, the excavated areas would be backfilled with clean material, graded to mitigate ponding, and revegetated or otherwise restored to match the surrounding area. The Panelyte Marsh and Former Monarch Raceway Channel would be backfilled to existing grades and restored to promote the re-establishment of native vegetation. All excavated materials would be sequentially stockpiled onsite during construction of a series of landfill containment cells, constructed onsite in the locations of the current Former Operational Areas. Post-removal confirmatory sampling and analysis would be performed at the excavation areas. The Panelyte Marsh, the Former Monarch Raceway Channel, and other wetland areas would be backfilled to existing grades and restored to promote the re-establishment of native vegetation and wetlands.

Work in the Former Operational Areas could potentially be carried out in the following manner:

- Excavate soils from the Monarch HRDL and temporarily stage the soils in the Western Disposal Area. Backfill the Monarch HRDL with approximately 10 feet of imported clean fill to establish the base liner 4 feet above the water table for the disposal cell. Construct the base liner, transport approximately 75 percent of the excavated Monarch HRDL soils back to the Monarch cell, place/grade/compact the soils, and construct the final cover system. The remaining 25 percent of soils volumetrically displaced would be transported offsite for disposal.
- Repeat the above process for the Bryant HRDLs/FRDLs, then the Former Type III Landfill.
- Repeat the above process for the western half of the Western Disposal Area, but do not construct the final cover system.
- Complete the process for the eastern half of the Western Disposal Area, and then construct the final cover system over the entire Western Disposal Area.

The containment system disposal cells would be designed and built to include a double composite base liner system constructed a minimum distance

of 10 feet above the groundwater table and graded to a minimum slope of 2 percent to promote drainage. For the purposes of FS cost estimating, it is assumed the base liner system would consist of the following components, from top down: a 40-mil primary FML, underlain by a geosynthetic clay liner (GCL), a leachate collection system consisting of a geosynthetic drainage composite (GDC) layer (consisting of a geonet that is heat-bonded on each side to a non-woven needle-punched geotextile) draining to a pumpable sump system, a leak detection system, a secondary 40-mil FML, and a secondary 3-foot compacted clay liner (or geosynthetic equivalent). The GCL would have a maximum hydraulic conductivity of 10^{-7} centimeters per second, and the GDC would have a minimum transmissivity of 3×10^{-4} square meters per second.

The removed materials would be placed within the disposal cells with a cover liner system sloped to grades of no less than 4 percent and consisting of the following components, from top down: a 6-inch vegetative soil layer, a 24-inch protective soil layer, a GDC (as described above), a 40-mil FML, a GCL, a non-woven needle-punched geotextile, a minimum 12-inch gas-venting layer with gas vents at appropriately spaced intervals, a basal non-woven needle-punched geotextile, and a soil grading layer. The cap would be constructed with appropriate erosion controls and other measures to protect against flood events and other natural or human-induced incidents that might otherwise threaten the integrity of the disposal areas. The final cover system would cover approximately 50 acres.

Excess excavated materials that do not fit in the landfill containment cells (height of the cells is limited due to the need to attain the desired side slope grade) would be transported to and disposed of in appropriately permitted offsite landfills. Approximately 25 percent of the soils targeted for excavation and re-emplacement in the Former Operational Areas and all of the soils excavated from the offsite outlying areas would be volumetrically displaced, which means that more than 460,000 yd^3 of materials would have to be transported offsite for disposal.

The materials would be transported to and disposed of in offsite landfills. Materials with PCB concentrations of 50 mg/kg or greater would be transported to and disposed of in approved offsite landfills permitted to receive TSCA-regulated wastes. Materials with PCB concentrations less than 50 mg/kg would be transported to and disposed of at other permitted and approved landfills as appropriate. Excluded from removal are the PCB-containing materials that may be located under existing buildings on the Goodwill property. Excavated areas will be backfilled with clean material, graded, and revegetated or otherwise restored to match the surrounding areas. The excavated and backfilled area would extend across approximately 65 acres.

As previously discussed, part of this alternative would include removal of 2,600 linear feet of sealed-joint sheet pile along the western bank of Portage Creek. The need to leave portions of the sheet pile wall in place for landfill slope and bank stability will be further evaluated in the design should this alternative be selected. The potential for groundwater mounding behind the wall will be included as part of the evaluation. The groundwater treatment system would be decommissioned and removed, and the network of groundwater extraction trenches, sumps, and wells currently in place behind the sheet pile wall would be removed and disposed.

Under Alternative 4, EPA would establish the groundwater monitoring system as described for Alternative 2.

EVALUATION OF ALTERNATIVES

EPA uses nine criteria to evaluate the different remediation alternatives individually and against

each other in order to select a remedy. This section of the Proposed Plan evaluates each alternative against the nine criteria and notes how each compares to the other options under consideration. More details can be found in the FS Report.

The nine criteria are divided into three groups: threshold, balancing, and modifying criteria. Alternatives that do not meet the threshold criteria are not considered further.

Threshold Criteria

1. Overall Protection of Human Health and the Environment

This criterion assesses how well the alternatives achieve and maintain protection of human health and the environment.

Alternative 1 would provide no improved protection over the current conditions, would provide no risk reduction, and would not be protective of human health or the environment. No RAOs would be achieved by Alternative 1.

The overall protectiveness to human health and the environment is similar for each active remedial alternative as long as all elements of the remedy, including O&M and monitoring, are properly maintained, RAOs 1 through 3 would be achieved for Alternatives 2, 3, and 4, the significant difference being that with increasing complexity of remedy, there are increased short-term risks.

Alternatives 2, 3, and 4 are each expected to be effective long-term remedies for Allied Landfill. Under these alternatives, the three RAOs would be achieved and ARARs would be met. The primary exposure pathways at Allied Landfill are associated with the following:

- Direct contact
- Transport via surface water runoff to Portage Creek or floodplain areas from erosion of exposed material with COCs above PRGs
- Transport of groundwater impacted by contaminated material

PCBs are located in the surface and subsurface soils and sediments onsite and in outlying areas. Alternatives 2, 3, and 4 each achieve protectiveness through excavation of exposed contaminated soils with consolidation onsite beneath a landfill cap or offsite disposal to prevent direct contact and transportation by erosion. Alternative 2C has an offsite incineration component for the most contaminated excavated soils. Alternative 3 includes complete removal and offsite disposal to eliminate the potential for exposure.

Under current conditions, PCBs are not migrating outside the waste via groundwater. Alternatives 2 and 4 each further mitigate the potential for groundwater transport through capping. Capping will prevent infiltration of surface water through the consolidated soils. The groundwater and seep samples with elevated PCB concentrations were generally located in areas of Allied Landfill that were not addressed by IRM activities. The areas would be addressed in each of the Alternatives 2 through 4. Alternative 3 includes complete removal and offsite disposal to eliminate the potential for leaching and colloidal transport.

As stated, EPA has analyzed groundwater data collected at and around Allied Landfill and has concluded that PCBs at concentrations that pose a risk are not migrating off-site via groundwater or surface water. Therefore, EPA believes that Alternatives 2, without additional groundwater components (i and ii) are protective. Addition of collection systems i and ii would not significantly increase the overall protectiveness of Alternatives 2.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

T_his criterion assesses how the alternatives comply with regulatory requirements. Federal and state regulatory requirements that are either applicable or relevant and appropriate are known as ARARs. Only state requirements that are more

stringent than federal requirements are ARARs. There are three different types of regulatory requirements: chemical-specific ARARs, action-specific ARARs, and location-specific ARARs.

Under Alternative 1, the requirements to reduce exposure or associated risk to acceptable levels, achieve an acceptable degree of protectiveness, and appropriately manage/operate disposal areas would not be achieved. The relevant action and location-specific ARARs vary among Alternatives 2, 3, and 4. ~~Alternatives 2 would meet the TSCA requirement with risk-based disposal approval under 40 C.F.R. § 761.61(c).~~Alternatives 2, 3 and 4 achieve the self-implementing on-site cleanup levels in the Outlying Residential and Commercial areas under 40 C.F.R. § 761.61(b). Under Alternative 2, the consolidation and capping of material in the landfills on site meets the risk-based method for the disposal of PCB remediation waste under 40 C.F.R. § 761.61(c).

Implementation of Alternatives 3 and 4 would result in the achievement of the identified ARARs. Under Alternatives 2, 3 and 4, compensatory wetland mitigation will be provided in accordance with the Section 404(b)(1) guidelines, 40 C.F.R. § 230.10(a) for any wetlands that are or have been filled during remediation. Under Alternatives 2 and 4, groundwater monitoring will be conducted to confirm that Site COCs meet Michigan Part 201 GSI criteria in groundwater venting from the shallow aquifer into Portage Creek. Further, Alternatives 2 and 4 include groundwater monitoring of the constituents in Table in both the shallow and lower aquifer to confirm that Site COCs are not impacting the lower aquifer. See Table. Safe Drinking Water Act MCLs are not considered ARARs at this time because EPA believes that Site COCs are not migrating off-site and do not reach the lower aquifer. Groundwater samples will be collected and analyzed from the shallow and lower aquifer in accordance with NREPA Part 201 and 40 C.F.R. Section 761.75(b).

Balancing Criteria

3. Long-term Effectiveness and Permanence

This criterion evaluates the effectiveness of the alternatives in protecting human health and the environment when the cleanup is complete. It also considers the effectiveness of the cleanup over the long term.

With the exception of Alternative 1, each of the remaining alternatives would be expected to meet RAOs 1 through 3 and provide long-term effectiveness and permanence once the RAOs are met. The active alternatives are combinations of proven and reliable remedial processes, and the potential for failure of any individual component is low.

Alternatives 2 and 4 would achieve long-term effectiveness and permanence through onsite containment of the material with COCs above RALs as a primary component of the remedy, with O&M, monitoring, and institutional controls to collectively ensure and verify the permanence of the remedy. Capping is a proven method of preventing direct contact and erosion of material containing PCBs. Alternative 2C does not significantly increase the long-term effectiveness of the remedy through incineration of excavated material with PCB concentrations greater than 500 ppm, because capping prevents direct contact exposure and erosion/transport exposure route.

Capping is an effective mechanism to prevent infiltration through materials containing PCBs. Currently PCBs have not been detected outside the waste in the groundwater. The installation of a cover system will serve to further mitigate the potential for infiltration and migration of PCBs out of the waste via groundwater. The addition of groundwater subalternatives i or ii do not

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significantly increase the long-term protectiveness of Alternative 2.

Alternative 3 would achieve long-term effectiveness and permanence by removing all material with COC exceedances from Allied Landfill and disposing of it at offsite solid waste landfills and TSCA facilities. Alternative 4 would achieve long-term effectiveness and permanence by placing the PCB material into containment cells constructed onsite with O&M, monitoring, and institutional controls.

Under Alternative 3, no long-term O&M or monitoring would be required onsite with the exception of areas where waste is left in place because of the proximity to buildings. Materials with COC concentrations above relevant RALs would be excavated and disposed of offsite. The large-scale removal and offsite disposal of materials presented in Alternatives 3 provides an added degree of permanence at Allied Landfill through removal.

Alternative 2 options are proven technologies that meet the requirements for effectiveness and permanence. Alternative 3 provides the greatest long-term effectiveness and permanence by removing the materials from the site. Alternative 4 provides an added level of protectiveness because wastes are ultimately disposed of in lined containment cells. The main difference between Alternatives 3 and 4 is that the waste is moved and managed offsite in Alternative 3. The long-term monitoring and maintenance components to be implemented in conjunction with institutional controls under Alternative 2 options, or 4 would provide the necessary mechanisms to verify that each remedy is performing as anticipated over time. As a result, Alternative 2 options and 4 are also expected to provide effective, permanent remedies. Given the site conditions, Alternative 4 may not be significantly more protective than Alternative 2.

4. Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment

This criterion addresses the preference for selecting remedial actions that use treatment technologies that permanently and significantly reduce toxicity, mobility, or volume of the hazardous substances. This preference is satisfied when treatment is used to reduce the principal threats at a site through destruction of toxic contaminants, reduction of the total mass of toxic contaminants, irreversible encapsulation, or reduction of total volume of contaminated media.

Treatment is not a component of any of the remedial alternatives carried forward except Alternative 2C. However, Section 300.430(a)(iii)(B) of the NCP contains an expectation that engineering controls, such as containment, will be used for waste that poses a relatively low long-term threat where treatment is impracticable. Alternative 1 does not reduce the toxicity, mobility, or volume of COC-impacted materials. Alternatives 2A, 2B, and 4 would reduce the mobility of COCs through isolation and containment. Alternative 2C is the only alternative that would result in a reduction of toxicity or volume by treatment with the offsite incineration of a portion of excavated soils. However, due to the nature of the materials, the PCBs do not appear to be mobile at Allied Landfill, regardless of concentration.

5. Short-term Effectiveness

This criterion examines the effectiveness of the alternatives in protecting human health and the environment during the cleanup until the cleanup is complete. It also considers protection of the community, workers, and the environment during the cleanup.

The evaluation of short-term effectiveness criterion are primarily related to the area and volume of COC-containing materials addressed in each alternative, the time necessary to implement the remedy, potential risks to workers, and potential impacts to the community during construction.

Short-term effectiveness is summarized in Table 6-2.

With the exception of Alternative 1, all the alternatives with active remedial components would have some short-term impacts including increased noise from construction vehicles, the potential for airborne dust releases, increased traffic in the vicinity of Allied Landfill, increased wear on local roads, increased potential for workers to come in contact with PCB-containing materials, and other risks associated with construction work. Alternative 2 options require the least amount of disturbance and shortest construction time. The impacts can be effectively addressed through implementing a project-specific health and safety plan, keeping excavation areas properly wetted, planning truck routes to minimize disturbances to the surrounding community, and other standard best management practices. Alternative 2C is less effective than 2A and 2B due to the potential for dispersion or erosion of excavated materials during characterization and segregation for incineration. Alternative 2C also incurs increased risks associated with offsite transport. Due to the limited number and location of TSCA permitted incineration facilities, transport for Alternative 2C is significantly greater distances than in Alternatives 3 or 4. The addition of subalternatives i or ii do increase the short term impacts of implementing Alternative 2 options, with subalternative ii having the greater impact.

Alternatives 3 and 4 present greater short-term impacts because of the amount of materials required to be moved and the increased construction duration. The project duration for the alternatives is longer than Alternative 2 options, increasing both construction-related and exposure risks to workers. The additional volume of materials to be handled in Alternatives 3 and 4 also result in an increase in truck traffic in the vicinity of Allied Landfill during the project. During the implementation of Alternative 3, there would be an average of 40 truck trips per day, year-round, for approximately 5 years. During the excavation and backfilling work under Alternative 4, there would be an average of 40 trips per day into and out of Allied Landfill for approximately 6 years. The increase in truck traffic results in an increased risk for vehicular accidents.

There are additional qualitative impacts to the local community, such as noise and dust, for a period of 5 years (Alternative 3) to 10 years (Alternative 4), which will place an increased burden on the community. There are no short-term impacts associated with construction or implementation for Alternative 1; however, since existing measures in place to control access to Allied Landfill would not be maintained, there could be an increased risk of direct exposure over the short term to individuals who trespass and come into contact with surficial materials containing COCs above the PRGs.

6. Implementability

This criterion assesses the technical and administrative feasibility of an alternative and the availability of required goods and services. *Technical feasibility* considers the ability to construct and operate a technology and its reliability, the ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of a remedy. *Administrative feasibility* considers the ability to obtain approvals from other parties or agencies and the extent of required coordination with other parties or agencies.

The primary remedial components of Alternative 2 options, 3, and 4 are proven, readily implementable, have been used successfully as part of other environmental cleanup projects, and they are expected to be reliable over the long term. All the alternatives are administratively implementable, and although no permits would be required, the substantive applicable requirements of federal and state regulations would be met.

In addition, Alternative 2 options, 3, and 4 could all be completed using readily available conventional earth-moving equipment, and most of the necessary services and construction materials are expected to be readily available. Qualified commercial contractors with experience at other areas of the Kalamazoo River Superfund Site are available locally to perform the work.

Alternatives 2C, 3 and 4 are more difficult to implement due to different constraining conditions. For Alternative 2C, there is limited availability of TSCA permitted incinerators. For Alternative 3, the availability of solid waste and/or TSCA landfills to accept the volume of materials to be disposed of offsite would be a limiting factor in terms of construction progress and overall cost. The limited staging area available for excavated materials during construction of the containment cells would be a limiting factor for Alternative 4.

Landfill Availability

There are few solid waste landfills in southwest Michigan that are available to accept PCB-containing material, regardless of whether that material meets solid waste regulatory requirements. The facilities commonly have limits on disposal capacity and disposal rates that may affect the timely completion of Alternative 3 and 4 in which a large volume of PCB- and other COC-containing material would be disposed of offsite. It is also possible that the combined disposal capacity in all of the nearby solid waste facilities and TSCA landfills would be insufficient for the large volumes of PCB-containing material proposed for disposal under Alternative 3. The result could be increased transport distances for offsite disposal, and consequentially increased risks and costs.

Construction of the Containment Cells

Additional implementability challenges associated with the construction of the containment cells in Alternative 4 include sequencing and space constraints, developing a plan for excavating 1,575,500 yd^3 of COC-containing materials, constructing the full-encapsulation disposal cells, and replacing the excavated materials in the cells. As each containment cell is sequentially constructed, a successively smaller area will be available onsite for staging of clean materials and temporary storage of COC-containing materials. Eventually, onsite capacity will be depleted, and a substantial volume of material will have to be disposed of offsite. Approximately 25 percent of the soils targeted for excavation and placement in the Former Operational Areas and all of the soils excavated from the offsite areas would be volumetrically displaced, resulting in more than 460,000 yd^3 of materials being transported offsite for disposal, which would have a significant impact on both the implementation and cost of this alternative. The control and management of surface water runoff from the temporarily stored COC-containing materials also will become increasingly challenging as less area is available for the operations under Alternative 4.

There are no technical or administrative implementability issues associated with Alternative 1 because no active remediation would take place.

7. Cost

This criterion evaluates the capital and operation and maintenance costs of each alternative. Present-worth costs are presented to help compare costs among alternatives with different implementation times.

The costs for the range of alternatives and subalternatives presented in this FS are summarized in Table 6-3. The detailed estimates and associated assumptions are presented in Tables 5-1 through 5-9. The cost estimates are consistent with FS-level of estimation, with an accuracy of +50 to -30 percent. A final cost estimate would be developed and

refined during the remedial design process after the selection of a recommended remedy. Alternative 1 has no associated capital or O&M costs since there would be no further actions taken, but does require 5-year reviews as shown with periodic costs.

TABLE 6-3
Summary of Remedial Alternative Costs
Allied Landfill—Allied Paper, Inc. / Portage Creek / Kalamazoo River Superfund Site

Alternative	Estimated Capital Cost	Estimated O&M Cost	Estimated Periodic Cost	Total Present-worth Cost
Alternative 1	$0	$0	$0	$0
Alternative 2A	$32 million	$4.0 million	$54,000	$36 million
Subalternative (i)	$1.5 million	$1.5 million		$3.0 million
Subalternative (ii)	$7.4 million	$1.5 million		$9.0 million
Alternative 2B	$32 million	$3.0 million	$54,000	$35 million
Subalternative (i)	$1.4 million	$1.5 million		$3.0 million
Subalternative (ii)	$6.2 million	$1.5 million		$8.0 million
Alternative 2C				
Alternative 3	$238 million	$0 million	$54,000	$238 million
Alternative 4	$136 million	$3.0 million	$54,000	$139 million

Note: Costs for subalternatives (i) and (ii) are the same for Alternative 2B and 2C.

Modifying Criteria

8. State/Support Agency Acceptance

This criterion considers the state's preferences among or concerns about the alternatives, including comments on regulatory criteria or proposed use of waivers.

The State of Michigan supports EPA's preferred alternative, Alternative 2B.

9. Community Acceptance

This criterion considers the community's preferences or concerns about the alternatives. Community acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the Record of Decision.

SUMMARY OF THE PREFERRED ALTERNATIVE

The preferred alternative for addressing contamination at Allied Landfill is Alternative 2B **(Consolidation of Outlying Areas and the Monarch HRDL on HRDL/FRDL)**. Alternative 2B is preferred over the other alternatives because once implemented it would:

- immediately prevent human and ecological exposure to contaminated materials at Allied Landfill;
- prevent erosion and off-site migration of contaminated materials from Allied Landfill; and
- prevent contaminated material at Allied Landfill from impacting groundwater or surface water emanating from Allied Landfill.

The preferred alternative is the appropriate remedy for Allied Landfill given site conditions. The alternative would achieve the performance goals within a reasonable time frame more cost-effectively than other alternatives and requires minimal effort to maintain protectiveness over the long-term. Alternative 2B meets the threshold criteria, offers a high degree of long-term effectiveness and permanence, and represents the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria.

Based on the information available at this time, EPA and the State of Michigan believe that the preferred alternative will be protective of human health and the environment, comply with regulatory

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criteria, be cost-effective, and use permanent solutions. The preferred alternative may change in response to public comment or new information.

COMMUNITY PARTICIPATION

EPA and MDEQ provide information regarding the cleanup of Allied Landfill to the public through public meetings, the Administrative Record file for the site, the Site Information Repository at the Kalamazoo Public Library, and announcements published in the XXX EPA and MDEQ encourage the public to gain a comprehensive understanding of the Site by reviewing this proposed plan and the information available at the public repository.

The dates for the public comment period, the date, location, and time of the public meeting and the locations of the Administrative Record files are provided on the front page of this Proposed Plan.

Table 2-3
Summary of Remediation Action Levels Proposed by EPA for PCBs

Allied Landfill Feasibility Study Report—Allied Paper, Inc. / Portage Creek / Kalamazoo River Superfund Site			
Medium	Pathway		PCB PRG
Soils	Human Health	Residential	1.02.5 mg/kg
		~~Non-Residential~~Commercial	1006 mg/kg
		Recreational	23 mg/kg
	Ecological	Aquatic (Mink)	0.5–0.6 mg/kg
		Terrestrial (Robin)	6.5–8.1 mg/kg
Subsurface Soils	Human Health	Residential	1.02.5 mg/kg
		~~Non-Residential~~Commercial	1006 mg/kg
		Recreational	23 mg/kg
	Ecological	Terrestrial (Robin)	6.5–8.1 mg/kg
Surface and Subsurface Sediments	Human Health	Fish Consumption	0.33 mg/kga
	Ecological	Aquatic (Mink)	0.5–0.6 mg/kg
Groundwater (including seeps)	Human Health	Direct Contact	3.3 µg/Lb
	Groundwater-Surface Water Interface (GSI)		0.2 µg/Lc
Residuals	N/A		Qualitative: Where a removal is proposed, all visible residuals are to be removed unless analytical data are available to confirm PCBs (if present) are below applicable criteria.

Notes:
a~~Default~~ sediment criteria of 0.33 mg/kg will be applied to shallow soil in areas of periodic inundation due to the potential runoff of shallow soils into surface water. Evaluation of contaminated soil runoff to surface water required under R299.5728(f).
bGroundwater for use as drinking water is not considered a complete pathway so the Part 201 Drinking Water criteria of 0.5 microgram per liter (µg/L) was not used. The Part 201 direct contact criteria were used for protection of human health due to the presence of seeps.
cThe ~~groundwater~~Michigan Part 201 GSI (criteria protective of surface water) is a PRG. ~~where the GSI is present.~~
mg/kg = milligrams per kilogram, µg/L = micrograms per liter, N/A = not applicable
Source: CH2M HILL 2009

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TABLE 1-1

Summary of VOCs, SVOCs, Pesticides, PCDD/PCDF, and Inorganic Exceedances

OU1 Feasibility Study Report–Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site

Analyte	Surface Soils	Subsurface Soils	Surface Sediments	Subsurface Sediments	Groundwater[1]	Seeps[2]
VOCs						
Carbon Tetrachloride		1/54				
Acetone			1/2			
SVOCs						
Acenaphthene			1/2			
Carbazole			1/2			
Dibenzofuran			1/2			
Phenanthrene		1/54				
4-methylphenol		12/54				
Naphthalene		1/54	1/2			
Pentachlorophenol		1/54	1/2			
Pesticides						
None						
PCDD/PCDF[3]						
Total TCDD Equivalent	1/8					
Inorganics						
Aluminum	1/2	26/55			5/72	1/37
Antimony		7/55				
Arsenic	1/2	9/54	1/2		23/72	10/37
Barium		23/55	1/2	1/1	4/72	4/37
Cadmium		5/55				
Chromium	2/2	53/55	2/2	1/1	1/72	
Cobalt		6/55				
Copper		23/55		1/1		
Cyanide		21/54			4/72	3/37
Iron	1/2	8/55	1/2	1/1	54/72	31/37
Lead	1/2	20/55	1/2	1/1	1/72	
Magnesium		13/55				
Manganese		4/55			56/72	36/37
Mercury		20/55		1/1		
Nickel		1/55		1/1	4/72	1/37
Selenium		10/55	1/2	1/1		
Silver				1/1	2/72	
Sodium					4/72	
Vanadium					1/72	1/37
Zinc		28/45	1/2	1/1	7/72	

Note:

TABLE 1-1

Summary of VOCs, SVOCs, Pesticides, PCDD/PCDF, and Inorganic Exceedances

OU1 Feasibility Study Report–Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site

Analyte	Surface Soils	Subsurface Soils	Surface Sediments	Subsurface Sediments	Groundwater[1]	Seeps[2]

x/y = number of samples (x) exceeding screening level criteria out of number of samples (y)

[1] Only the data from the 2002/2003 groundwater and seep samples are summarized to reflect conditions after removal

[2] Dioxin and furans only sampled in surface soils in 1998

PCDD = polychlorinated dibenzodioxins; PCDF = polychlorinated dibenzofurans

TABLE 6-2
Summary of Short-term Effectiveness Considerations
Allied Landfill—Allied Paper, Inc. / Portage Creek / Kalamazoo River Superfund Site

Alternative	Total Area Addressed	Total Volume of COC-Containing Materials Excavated	Duration	Worker Risks	Community Impacts
Alternative 1	No areas addressed	No volume of impacted PCB-containing materials addressed	No time period to implement	No worker risks from implementation as no action is taken.	Potential offsite migration of COC-containing materials.
Alternative 2A	42 acres	316,000 yd^3	Approximately 2 years	Least of the active alternatives; managed by health and safety plan.	Associated with dust, noise, and truck traffic.
Alternative 2B	42 acres	486,000 yd^3	Approximately 2 years	Slightly increased due to moving Monarch HRDL; managed by health and safety plan.	Slight increase; associated with dust, noise, and truck traffic.
Alternative 2C	42 acres	486,000 yd^3	Approximately 2 years	Greater than 2A and 2B due to potential exposure during characterization and transportation.	Greater than 2A and 2B due to additional management for characterization and offsite transport.
Alternative 3	52 acres	1,575,500 yd^3	5 years	Greater than Alternative 2 given the area/volume of targeted material; Increased travel for disposal and increased project duration.	Greater than Alternative 2; associated with noise, dust, and particularly increased truck traffic, which would average 40 trips daily in and out of Allied Landfill for the duration of the project. Greatest number of miles driven due to volume transported to disposal facilities with limited locations.
Alternative 4	52 acres	1,575,500 yd^3	10 years	Greater than Alternatives 2 and 3 given the	Greater than Alternatives 2 and 3; associated with noise

TABLE 6-2
Summary of Short-term Effectiveness Considerations
Allied Landfill—Allied Paper, Inc. / Portage Creek / Kalamazoo River Superfund Site

Alternative	Total Area Addressed	Total Volume of COC-Containing Materials Excavated	Duration	Worker Risks	Community Impacts
				area/volume of targeted material and significantly increased project duration.	and dust over the longest project duration. Slightly more truck trips than Alternative 3, but 1/3 of the miles outside Allied Landfill due to decreased volume transported to disposal facilities.

Table 2-4
Summary of Proposed Remediation Action Levels for COCs
Allied Landfill Feasibility Study Report—Allied Paper, Inc. / Portage Creek / Kalamazoo River Superfund Site

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		Residential Soils/Sediments (µg/kg)				Groundwater (µg/L) and Seepsa	
	Analyte	Statewide Default Background Level	Residential Drinking Water Protection Criteria & RBSLs	Groundwater Surface Water Interface Protection Criteria and RBSLs	Direct Contact Criteria & RBSLs	Residential Drinking Water Criteria & RBSLs	Groundwater Su
SVOCs							
4-methylphenol		N/A	7,400	1,000	11,000,000	370	30
PCDD/PCDFb							
Total TCDD Equivalentd			NLL	NLL	0.09	N/A	
Inorganics							
Aluminum (B)		6,900,000	6,000,000	N/A	50,000,000	50	N/A
Antimony		N/A	4,300	94,000	180,000	6	130
Arsenic		5,800	4,600	4,600	7,600	10	10
Barium (B)		75,000 c	1,300,000	660,000 (G)	37,000,000	2,000	1,000 (G)
Cadmium (B)		1,200 c	6,000	3,000 (G)	550,000	5	2.5 (G)
Chromium		N/A	30,000	3,300	2,500,000	100	11
Cobalt		6,800	800	2,000	2,600,000	40	100
Copper		32,000 c	5,800,000	100,000 (G)	20,000,000	1,000	18 (G)
Cyanide		390	4,000	100	12,000	200	5.2
Iron (B)		12,000,000	6,000	N/A	160,000,000	300 (E)	N/A
Lead (B)		21,000 c	700,000	2,500,000 (G)	400,000	4	14 (G)
Magnesium (B)		N/A	8,000,000	N/A	1,000,000,000	400,000	N/A
Manganese (B)		440,000	1,000	26,000 (G)	25,000,000	50	1,300 (G)
Mercury		130	1,700	50	160,000	2	0.0013
Nickel		20,000 c	100,000	100,000 (G)	40,000,000	100	100 (G)
Selenium		410	4,000	400	2,600,000	50	5
Zinc		47,000c	2,400,000	230,000 (G)	170,000,000	2,400	235 (G)

aOnly the data from the 2002–2003 groundwater and seep samples are summarized to reflect conditions after removal.
bDioxin and furans were only sampled in 1998.
cBackground value used in RI as screening criteria, lowest risk-based level highlighted used for COC comparison.
N/A = Not Applicable, NLL= Not likely to leach, RBSL = risk-based screening level, µg/kg = micrograms per kilogram
(B) Background, as defined in R 299.5701(b), may be substituted if higher than the calculated cleanup criterion.
(E) Criterion is the aesthetic drinking water value, as required by Section 20120a(5) of the Natural Resources and Environmental Protection Act 1994 PA 451, as amended by the Natural Resources and Environmental Protection Act of 1994
(G) Calculated value dependent on ph, hardness
Highlighted cells = lowest applicable criteria
Source: Non-Residential Part 201 Generic Cleanup Criteria and Screening Levels; Part 213 Tier 1 Risk-Based Screening Levels, document release date March 25, 2011.

TABLE 6-1

Comparative Analysis of Alternatives

Allied Landfill Feasibility Study Report—Allied Paper, Inc. / Portage Creek / Kalamazoo River Superfund Site

Alternative	Description	Overall Protection	Compliance with ARARs	Long-term Effectiveness	Reduction of Toxicity, Mobility or Volume through Treatment	Short-term Effectiveness	Implementability	Cost
Alternative 1	No action	Not protective. No action would be taken.	Would not meet ARARs	Not effective. Site conditions would remain the same.	No reduction of toxicity, mobility, or volume.	No worker risks. No action to be taken.	Implementable as no action would be taken.	$0
Alternative 2	Consolidation and capping							
2a	Construct caps on both Monarch and Operations areas	Protective. Remaining exposed contamination would be covered and contained. Infiltration of surface water would be minimized.	Meets most ARARS.	Effective.	No reduction of toxicity, mobility, or volume would be achieved.	Implementation over 2-year period, most effective of active alternatives. Worker risk associated with dermal contact, inhalation, and ingestion. Risks are controllable. Community impacts associated dust, noise, and traffic.	Proven technology that has been implemented at similar OUs.	$36 million
2b	Consolidate Monarch within Operations areas	Protective. Remaining exposed contamination would be covered and contained. Consolidation of the Monarch HRDL within the operations area would reduce the amount of monitoring required.	Meets most ARARS.	Effective.	No reduction of toxicity, mobility, or volume would be achieved.	Implementation over 2-year period, slightly longer than 2a. Worker risk associated with dermal contact, inhalation, and ingestion. Risks are controllable. Community impacts associated dust, noise and traffic.	Proven technology that has been implemented at similar OUs. Combining Monarch on the Operations area would reduce the footprint of contamination.	$35 million
Alternative 3	Total Removal and Offsite Disposal	Protective. Contamination would be disposed of at an approved landfill facility both hazardous and non-hazardous.	Meets ARARS.	More effective than Alternative 2 due to removal from Allied Landfill. No cover maintenance or source for potential groundwater impacts.	No reduction of toxicity, mobility, or volume would be achieved. Volume may be increased if soils require dewatering by addition of cement.	Implementation over 5-year period. Worker risk associated with dermal contact, inhalation and ingestion would occur over a longer period of time. Risks are controllable. Community impacts associated dust, noise, and traffic.	Proven technology, landfill space in the area could be limited requiring the hauling of waste a significant distance from Allied Landfill.	$238 million
Alternative 4	Encapsulation Containment System	Protective. Little advantage achieved by construction of the liner. Compacted waste can achieve $10E^{-7}$ centimeters per second hydraulic conductivity on its own limiting groundwater flow through the material.	Meets ARARS.	More effective than Alternative 2. The source material is fully encapsulated further minimizing potential for groundwater impacts.	No reduction of toxicity, mobility, or volume would be achieved.	Implementation over 10-year period. Worker risk associated with dermal contact, inhalation, and ingestion would occur over a longer period of time. Risks are controllable. Community impacts associated dust, noise is the least short-term effective alternative.	Proven technology.	$139 million

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